

DISCHARGE CHUTE WITH VARIABLE SLOPE BOTTOM FOR FRAGILE ARTICLE SORTING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to improvements in the infeed and discharge receiver for high speed vision system sorting apparatus used to sort fragile articles such as potato chips. More particularly, this invention relates to infeed and receiving chute members having a variable slope and set in a predetermined position to catch and adequately control deceleration of the fragile articles and to prevent undue breakage of the fragile articles.

2. Background and Prior Art

In the production of potato chips on an industrial scale, it is known to utilize a vision inspection system to inspect potato chips visually and then reject those which are not up to visual standards. Typical rejection mechanisms utilize a line of air nozzles operated in accordance with processed signals indicating whether the chips should be rejected or not. The chips travel on a high speed inspection conveyor during the inspection. Such a machine is sold under the trademark OPTI-SORT manufactured by Simco-Ramic. A patent illustrating one such optical inspection system is U.S. Pat. No. 4,581,632.

In adapting the Simco-Ramic OPTI-SORT machine to potato chips the chips travel in a monolayer on a rapidly moving inspection conveyor. The inspection conveyor is traveling at such a relatively high rate of speed that all chips are thrown from the end of the conveyor and follow a known trajectory. Air from an air reject module is used to reject chips by blowing them out of the trajectory that acceptable chips follow. In the Simco-Ramic approach the acceptable chips then land on another conveyor which decelerates the speed of the chips to a more appropriate speed for further processing.

Another known means of catching and decelerating acceptable chips in a similar type environment utilizing an optical inspection device is with a rigid flat bottom chute positioned in the path of acceptable chips. However, in practice it was found that the use of an ordinary flat bottom chute can contribute to product breakage. Furthermore, it does not decelerate the product effectively.

The use of the known deceleration conveyor also causes breakage since the chips hit the belt at an angle while traveling at a high rate of speed. Moreover, the flat belt conveyor used as a landing area for the non-defective product requires energy to operate; requires maintenance; and contributes to excessive length of the inspection station equipment and excessive use of floor space.

Accordingly, there is need in the art for an effective means of receiving acceptable chips from an optical sorting machine which does not cause undue breakage; does not take excessive floor space; and which provides for control of deceleration.

SUMMARY OF THE INVENTION

This invention is in combination with a sorting machine for sorting lightweight fragile items having a large surface area such as potato chips, the sorting machine being of the type having an inspection conveyor traveling at a high speed on which the chips to be in-

spected by inspection means are thrown from the end of the conveyor into space and an air nozzle reject selecting means is operative to direct the blast of air against the rejected chips to change their trajectory after being rejected from the end of the inspection conveyor. The improvements of this invention are primarily in the receiving means for receiving acceptable (non-rejected) chips to minimize breakage; to take up a small amount of space; and to decelerate the speed of the acceptable items. This receiving means includes a generally "S"-shaped stationary chute having a variable slope between the top and the bottom of the "S". The chute is supported spaced from the end of the conveyor so as to be in the trajectory of the acceptable chips and out of the trajectory of unacceptable chips. The chute is positioned so that the variable slope presents a minimum impact angle to the path of the acceptable items and the bottom of the "S"-shaped chute is shaped to allow efficient deceleration and removal of the acceptable chips for further processing. A similar "S"-shaped chute with a short transition length to avoid decelerating product prior to entering the high speed inspection conveyor is also utilized, and has the added advantage of spreading the chips out and preventing formation of clumps which would interfere with the vision inspection system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of the known prior art arrangement.

FIG. 2 is a schematic illustration of this invention.

FIG. 3 is a schematic illustration of the use of this invention as an infeed chute.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The prior art shown in FIG. 1 is a portion of an optical inspection machine including an inspection conveyor 10 on which products (for example potato chips) to be inspected are moved in a single layer (monolayer) rapidly past a visual inspection means. The visual inspection means is connected to an air reject module 12 having an air nozzle means 14 so that individual chips which do not pass visual inspection are rejected by selective blasts across the width of the inspection station from the air nozzle. The air nozzle means includes a large number of individual nozzles to precisely blow rejected chips from the trajectory. The air from selected nozzles changes the trajectory of the chips thrown into space off the end of the fast moving conveyor 10 so that the path of rejected chips is shown in dashed line 16 and the path of acceptable chips is shown in dashed line 18. The acceptable chips land on a slower moving deceleration conveyor 20 which decelerates the speed of the inspected acceptable chips to a point which is typical and appropriate for further processing. As a non-limiting example, the landing speed of the acceptable chips as they are impacting onto the conveyor is at a speed of about 380 feet a minute, and this causes undue breakage. Additionally, any moving conveyor will require energy and maintenance and in this case also requires space because the chips must be decelerated to a final exit speed of around 100 feet per minute for further chip processing.

A similar problem exists with flat bottom or plate-like chutes even when positioned at an angle in the path of acceptable chips, and in using such chutes the breakage rate may be higher.